

Amendment and Response

Applicant: Edward Fuergut et al.

Serial No.: 10/529,565

Filed: October 31, 2005

Docket No.: I431.126.101/FIN 481 PCT/US

Title: ELECTRONIC COMPONENT AND A PANEL

REMARKS

The following remarks are made in response to the Non-Final Office Action mailed March 28, 2007. Claims 10-25 were rejected. Claims 10-25 remain pending in the application and are presented for reconsideration and allowance.

Claim Rejections under 35 U.S.C. § 103

The Office Action, in section 4, rejected claims 10-25 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Hoffman (US 6,737,750) and Ma (US 6,271,469). Applicant respectfully traverses these rejections.

It is well accepted that, to establish a *prima facie* case of obviousness, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teaching. Without a motivation to combine, a rejection on a *prima facie* case is not proper. See MPEP 2143.

The Office Action states that the motivation for combining the teachings of Hoffman and Ma is “to increase surface area for trace formation.” However, in comparing the figures of Hoffman and Ma reproduced above, there does not appear to be any additional surface area for trace formation in the encapsulated die disclosed in Ma than the substrate shown in Hoffman. Thus, the Office Action does not appear to identify sufficient motivation to combine the references.

Moreover, among other things, if a proposed modification of the teachings of a prior art reference render the prior art device unsatisfactory for its intended purpose, or if the proposed modification changes the principle of operation of prior art device, there is no suggestion for the proposed modification. See MPEP 2143.01.

The Office Action admits that Hoffman fails to disclose or suggest the first face area of the plastic encapsulation and the active first face of the first chip forming an overall first face, as recited in claims 1, 15 and 19. Regarding the Hoffman disclosure, the Office Action specifically cites Figure 6A, which is reproduced below.

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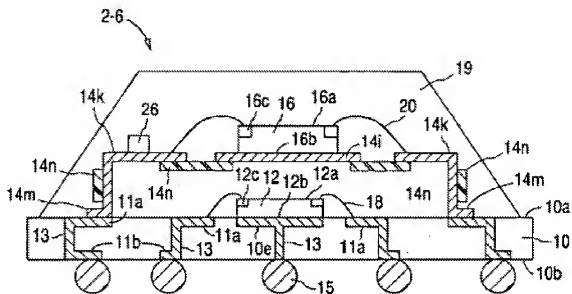


FIG. 6A

As shown in Figure 6A of Hoffman, the inactive side 12b of a first die 12 is mounted on a metal die pad 10e on a first surface 10a of a substrate 10. Col. 3, ll. 20-23. Hoffman further teaches,

“A protective insulative unitary body of a hardened encapsulant 19 may be provided over first die 12, conductive wires 18, support structure 14, second die 16, conductive wires 20, and all or a sub-portion of first surface 10a of substrate 10 by molding or pouring a resin compound, such as epoxy, over substrate 10.”

Col. 6, ll. 59-64. Thus, the encapsulant 19 is *over* the substrate 10; it does not appear that this passage discloses or suggests encapsulating the substrate 10.

The Office Action relies on the disclosure in Ma of a “planar face of die and encapsulant,” saying, “It would have been obvious ... to use the teachings of Ma on the device of Hoffman.” In support of this statement, the Office Action cites col.4, ll 1-5 of Ma, which refers to Figure 1c, reproduced below.

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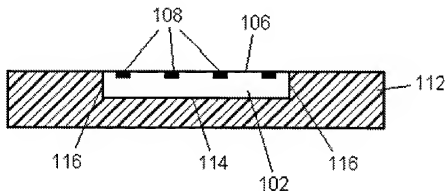
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FIG. 1c



Substituting the encapsulated die 106 with the die 12/substrate 10 combination in the Hoffman device appears to change the principle of operation of the Hoffman device and render it unsatisfactory for its intended purpose.

First, as shown in Figure 1c of Ma, the die 106 is shown set into encapsulation material 112. In contrast, the die 12 disclosed in Hoffman has its inactive side mounted on a substrate, with encapsulation material 19 on the substrate 10, encapsulating the die 12 and associated structures. Regarding the purpose of the encapsulation material 19, Hoffman teaches,

“First, encapsulant 19 acts as a moisture barrier keeping moisture from contacting first die 12 and conductive wires 18, as well as support structure 14, second die 16, conductive wires 20, and a portion of first surface 10a of substrate 10. Second, encapsulant 19 increases the overall strength and physical integrity of semiconductor package 2-1. Third, encapsulant 19 helps to ensure that semiconductor package 2-1 will not be damaged when exposed to different solder reflow temperatures.”

Col. 5, ll. 13-22. Thus, it appears that Hoffman teaches the provision of the encapsulant 19 for protection, etc., of the structure *above* the substrate 10. Encapsulating the die 12 of Hoffman in the manner taught by Ma, wherein the encapsulation 112 surrounds the lower portions of the die 106, changes the operation and purpose of the encapsulation material 19 disclosed in Hoffman. Encapsulating the die 12 of Hoffman with the encapsulation 112 as shown in Figure 1c of Ma

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provides none of the benefits or functions taught by Hoffman resulting from the encapsulation 19 over the substrate 10.

Thus, Applicants respectfully submit that the encapsulations disclosed in Hoffman and Ma are provided for entirely different purposes. Encapsulating the Hoffman device in the manner disclosed in Ma, as suggested in the Office Action, changes the principle of operation of the Hoffman device and fails to perform the purpose disclosed in Hoffman of protecting the structure *above* the substrate. Therefore, there is no motivation to combine the references.

Further, in its background section, Hoffman notes that heat dissipation is a problem with stacked semiconductor packages. To address this, Hoffman teaches, “Die pad 10e may be thermally coupled by a via 13 to a conductive ball 15 on second surface 10b substrate 10 to transfer heat from first die 12.” Col. 3, ll. 22-25. The disclosure of Hoffman thus teaches attaching the inactive side 12b of the die 12 to a metal die pad 10e to conduct heat away from the die 12. In contrast, Figure 1c of Ma simply illustrates a die 106 in encapsulation material 112. There is no metal die pad in the Ma Figure, and there is no citation in the Office Action that indicates Ma teaches or suggests further encapsulating a metal die pad attached to the inactive side of the die 106 to conduct heat from the die.

Thus, substituting the substrate and die assembly shown in Hoffman with the encapsulated die disclosed in Ma renders the Hoffman device inoperable for its intended purpose: dissipating heat from the die. As such, there is no motivation to combine the references.

Moreover, the two references relate to different types of electronic components. Hoffman teaches an electronic component which includes a stack of semiconductor chips mounted on, and electrically connected to, a conventional rewiring board which is substantially larger than the chip. In contrast, Ma teaches a chip sized package including a single chip embedded in a plastic composition which is only slightly larger than the semiconductor chip itself.

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The technical problems associated with the two types of package are different and the applications in which they are used are different. The skilled person would not have looked to one technical field when looking to solve a problem in the other. In the Applicant's view, the skilled person would not have combined these documents. It would not have been obvious to form an encapsulation material for dice that is coplanar with the active surface of the die in order to increase surface area for trace formation, as taught by Ma, in the electronic component of Hoffman. However, the electronic component taught by Hoffman does not suffer from the problems of lack of surface area for trace formation since Hoffman teaches an electronic component including a rewiring substrate which is substantially larger than the semiconductor chip. The skilled person would not see any advantage, or have any motivation, in rearranging the lower chip of Hoffman in order that the first face are of the plastic encapsulation and the active first face of the first chip form an oval first face as taught by Ma, since the problem of lack of surface area for trace formation is not present in the electronic component of Hoffman. Therefore, the skilled person would not have considered reference of Ma relating to chip size packages since the technical advantage in the larger package of Hoffman.

The application provides an electronic component with characteristics conventionally associated with either a chip sized package or a stacked package. These packages were, for the invention, developed quite separately. It is only the result of an inventive step that would lead the skilled person to the idea of using a chip scale package type rewiring layer in an electronic component comprising a stack of semiconductor chips. It is also not obvious to use the stacked arrangement of Hoffman in a chip-sized package. The prior art provide no teaching which would lead the skilled person to use a single chip sized package-type rewiring structure for both a lower semiconductor chip, whose active surface forms an overall first face with the plastic encapsulation compound, and for a stacked chip which is arranged in a raised position within the package on a leadframe with contact pillars.

For at least these reasons, independent claims 10, 15 and 19, and all the remaining claims dependent thereon, are believed to be patentable over the combination of Hoffman and Ma.

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CONCLUSION

In view of the above, Applicant respectfully submits that pending claims 10-25 are in form for allowance and are not taught or suggested by the cited references.

No fees are required under 37 C.F.R. 1.16(b)(c). However, if such fees are required, the Patent Office is hereby authorized to charge Deposit Account No. 50-0471.

The Examiner is invited to contact the Applicant's representative at the below-listed telephone numbers to facilitate prosecution of this application.

Any inquiry regarding this Amendment and Response should be directed to Mark L. Gleason at Telephone No. (612) 767-2503, Facsimile No. (612) 573-2005. In addition, all correspondence should continue to be directed to the following address:

Dicke, Billig & Czaja
Fifth Street Towers, Suite 2250
100 South Fifth Street
Minneapolis, MN 55402

Respectfully submitted,

Edward Fuergut et al.,

By their attorneys,

DICKE, BILLIG & CZAJA, PLLC
Fifth Street Towers, Suite 2250
100 South Fifth Street
Minneapolis, MN 55402
Telephone: (612) 767-2502
Facsimile: (612) 573-2005

Date: 06/26/2007

MLG:cjs

/Mark L. Gleason/

Mark L. Gleason

Reg. No. 39,998